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Address of the President of the Illinois Gas Association.

It is indeed a pleasure to welcome my fellow members and our guests to this, the 12th annual meeting of the Illinois Gas Association, and to assure our distingished visitors that we invite their hearty participation in the coming activities of the gas men of Illinois.

I extend my warmest greetings to those members of the gas fraternity who have come from far and near and now honor our meeting with their presence; but it is with a most humble spirit that I undertake the burden of addressing you concerning subjects upon which many of you are much more qualified, than I, to speak. However, the thought that no two of us ever view all things in exactly the same light, makes much easier my task of submitting for your consideration the ideas associated with my outlook upon matters that concern us all.

MR. R. B. HARPER,
President, Illinois Gas Association.

We meet again after a year of events unusual in the history of our Association, and of serious moment to the welfare of our country and other nations of the world. Because of this, I feel impelled to treat of some matters in a rather broader way than might be expected in an address of this sort. However, while treating of those topics which suggest themselves as being of a broad or basic nature with respect to our human relations, I will touch upon various matters more specifically associated with the past, present and future of the Illinois Gas Association.

THE PAST.

Constructive co-operation has ever been the means by which rapid progress has been made possible in all activities of the human race. Its value was early recognized by the prominent gas men of Illinois, who, on May 18th, 1905, organized the Illinois Gas Association. At first the membership of the Association was composed chiefly of gas companies, but before long the advantages to be derived by allowing membership to practically every man who took interest in the meeting, became apparent; and consequently on March 20, 1907, the necessary changes in the By-Laws were effected. The wisdom of the change is evident, for since that time the Illinois Gas Association has increased its membership fourfold, until at present we have an organization of over 400 members. The Association has established a record of having been pioneers in various movements of interest and value to the gas industry, and of accomplishing much of educational value to the gas men of Illinois, and the gas fraternity at large.

It is not my purpose to dwell upon the past achievements of our Association, except for the purpose of calling your attention to the value of constructive co-operation as exemplified by the things already accomplished.

The past year has been productive not only of numerous activities—some of them unique in the work of our Association—but also of various changes in matters of interest to gas men.

On September 27, 1915, your Association, in fulfillment of its acceptance of an invitation from the International Gas Congress, held an adjourned meeting at the Palace Hotel in San Francisco. No papers were prepared for the occasion, but your President gave a short address, in which he urged the members to do all within their power to represent the gas men of Illinois, to support the International Gas Congress, and to make manifest their appreciation of the hospitality of their gas brethren of the Pacific Coast. The International Gas Congress has become a matter of history, and a pleasant memory to those who were so fortunate as to be in attendance at its various sessions and entertainments. The Panama-Pacific International Exposition, so closely connected in many ways with the International Gas Congress, has faded from the eye, but its indescribable beauties by day, its wonderful illuminating effects by night and, above all, its great service in education and inspiration, will not be readily forgotten by those who visited it. I cannot speak of the Congress without alluding to the bountiful hospitality of our brother gas men of the Pacific Coast toward the visiting gas men and their ladies from this side of the Rockies. No words of mine can convey to those of you who were unable to attend, how deeply our hearts were stirred by the many evidences of fraternal spirit and good will with which we were continually surrounded. Be assured that your fellow members who attended the International Gas Congress made every effort to represent the Illinois Gas Association creditably and to show their appreciation of the good will and brotherly love displayed by the gas men of the Golden West.

The current year has given us waves of business depression and of prosperity, and apparently has wrought some changes in our social and political fabric. Demagogues, who incite prejudice to further selfish interests, are still to be found. However, if I mistake not the sign of the times, these impediments to real progress are slowly but surely being revealed to the thinking public as obstacles to the true advancement of our community life.

The analine dye famine during the past year, the development of benzol and toluol production, and other conditions due to that terrible conflict on the other side of the Atlantic, should bring a full realization of the important part played by the gas industry in the world activities. The desirability of full development of our resources in the by-products and so-called wastes of the gas industry has been forcibly brought to our attention. However, proper legislation, protection and financial inducement are necessary before we can hope to secure the fullest development of the by-products of gas manufacture into those refined products, now so useful in

the textile and medicinal arts and for many industrial and domestic purposes.

In other ways this has been an unusual year in our Association history, because of the number of temporary committees at work. In a spirit of co-operation, a special Committee on Meter Shelves was appointed to aid the American Gas Institute Committee on Consumers Meters.

THE PRESENT.

To-day finds us ready to proceed upon our annual quest for more knowledge of the details, technical and otherwise, of our business, by the reading of papers and participation in the discussions in which we no doubt will find many gems of wisdom not hitherto revealed. It finds us again meeting our old acquaintances among our fellow gas men, and also making new friendships, many of which will be among our most cherished possessions in the years to come. Let us make the most of our opportunity, for, without a doubt, the problems of the future will need our best efforts for their proper solution.

The present year marks the 100th anniversary of the gas business in this country, for in 1816, the first gas company incorporated in the United States began to light the streets of Baltimore. Strange enough, two important and enduring advances were made at the same time, one in the storage and the other in accurate measurement of gas, for just ten decades ago the first cylindrical gas holder was constructed, and the revolving drum wet meter was invented. This I mention, so that you are reminded that our industry was founded in an age when the civilized world had just begun to realize the power to be found in the knowledge and application of Nature's laws. You are doubtless impressed with the fact that it must have been indeed well founded to survive the competing influences of other great achievements of the past century, and to have grown to its present magnitude and usefulness among the great industries of the present time.

In this age of scientific and material progress, advancement is purely relative, and no great industry can afford to advance too slowly, much less stand still, for it must then surely fall behind. Compared with the past, the present problems of the gas industry are intricate and complex, but this fact should not cause a single gas man to falter in his efforts to solve the difficulties, nor lead anybody into believing that gas is falling behind in the procession of useful commodities rendering service to the public.

There are those, steeped in pessimism, afflicted with narrow or prejudiced mental vision, or suffering from a disordered imagination, who would have us believe that the gas industry is in a decline, that members of the gas fraternity include no men of prominence, and that gas men are not progressive nor even possessed of average intelligence. The present has no place for persons of that type, who have nothing but disparaging remarks or base insinuations to make; and it is a sign of certain moral or mental decay when people seek to impress the world with their own imagined and exalted virtues, by attacking the integrity and intelligence of their fellow men.

The fault, if it be a fault, not to know all the mysteries of nature, lies not with the gas industry nor the men engaged in its various activities. Ignorance of some of Nature's laws is not a fault, for it is given to no gas man to know all things. I doubt if there is any group of individuals, other than gas men, engaged in the manufacture, distribution and utilization of a commodity more complex and subject to more different laws of Nature. Therefore, it is no wonder that we have not yet solved all of our problems. We deal with some of the useful elements of Mother Earth, converting them into almost infinite varieties of mixtures of useful gaseous constituents, which are subject to many variable conditions during the manufacture, distribution and utilization of the commodity. It is because we have so many complex and intricate considerations and difficult problems to solve, as compared to many other industries, that sometimes leads the weak-hearted pessimists and others to speak disparagingly or despairingly.

It is fortunate that the pessimist is a very small minority, and often is not even a member of the gas fraternity. Fortunate, also, are gas men in the possession of these complexities of unusual number, for their very existence gives almost infinite possibilities in the manufacture and utilization of their commodity. One by one more of the intricate details that govern will be added to the great fund of knowledge already placed to the credit of the Gas Fraternity. The gas industry and its faithful workers need no defense; for I am sure we are all in accord with the thought that the gas business is a live, growing and needed activity in community life.

Under present day restrictions, competitions, and other handicaps, the gas business is not the financial bonanza it is supposed to be, in the popular imagination. However, despite its difficulties, the gas industy is a healthy growing business because it its carried on by brave men convinced that their commodity is needed in the home, store, factory and elsewhere for thousands of useful purposes, even though the margin of profit is not commensurate with that obtained in other business of equal financial hazard. I prefer to think of the gas industry as a sturdy tree that has not yet reached its full development. Over a hundred years ago, William Murdock may be said to have planted the seed, which has germinated and developed into the healthy giant of to-day. His immediate successors did much to aid the growth of the tree, which has always received its nourishment from Mother Earth, and has developed sturdy roots which draw upon some of the most useful and common elements of nature.

In the early days of the growth of the tree, the sap was utilized mainly in the nourishment of a slender shoot or trunk that served to introduce and establish the plant in the world wherein it was destined to develop. Likewise, gas, which is to gas business what sap is to the tree, was utilized mainly for the production of light in open flame burners, which served to introduce and establish the gas industry among the progressive activities of the world. To continue the comparison, we find that to-day the great bulk of the sap of the tree is no longer put to its initial use, but finds its way into numbers of branches where it serves entirely new purposes in the production of buds, leaves and fruit. Likewise the great bulk of gas is no longer utilized in the production of "candle power" in flat flame burners, but now finds its service in the production of "heat units" for thousands of useful purposes in various branches of utilization.

Now that we find ourselves with a healthy tree, the bulk of whose life sap is being utilized in the development of many branches, twigs, leaves and fruit, rather than for the purpose prevailing at the time of its early growth, how absurd it is to valuate the sap for other purposes than its power to produce leaves, fruit and the essential utilities of the tree. In like manner, how obsolete is the custom of valuating gas by its power to produce "candle power" in an open flame burner (which has long since been superceded by burners based upon entirely different principles) rather than its usefulness in the production of "heat units" so important in practically every variety of utilization at the present time. It remains for the Luther Burbanks of the gas business, to study every part of this tree, cause new branches to develop, strengthen the old limbs, and not only increase the yield and quality of the fruit, but perhaps even cause new varieties of fruit to be borne.

Our various gas associations and organizations, which are of great help in diffusing the knowledge useful in developing the gas industry, also need development in a manner somewhat comparable to the sturdy tree that I used as a symbol of the gas business. Like the tree in its early life, our gas associations have concerned themselves mostly with the problems of manufacture and distribution; and rightly so, because the proper manufacture and distribution of gas was, in the early days of the industry, what the proper formation and circulation of sap is to the young growing tree. To-day, however, gas associations must concern themselves with the problems of utilization, as well as with questions involved in manufacture and distribution; for after all, the development of proper uses for gas has become as important as the utilization of the life sap of a maturing tree in the production of fruit. This means that gas association work, through the medium of papers, committee reports, etc., should be such as to be of interest and value to the commercial man, the manufacturer of gas consuming appliances, the accountant, and in fact to every man engaged in any phase of the gas business.

To properly consider the questions of construction, manufacture, distribution and utilization, as well as other matters more or less associated with these independed considerations, we should have one National and authoratative organization; for two or more National bodies do not give the gas industry the best form of constructive co-operation, nor prevent conflict in policy, scope of work or results attained. The many different fields of activity in the gas business make specialization in National association work desirable; but the value of this individual and intensive effort is greatly lessened by unnecessary but unavoidable duplication, unless the single specialized endeavors form part of a centralized system of work, covering the entire field of subjects relating to the gas industry.

It is hoped that some day it will be possible for the gas men to see such organizations as the American Gas Institute and the National Commercial Gas Association merged into one National body,

to which all local or State associations can look as to a parent organization, for authority and guidance.

Whatever may be the eventual outcome as regards a single National gas organization, I believe that the Illinois Gas Association will stand ready to do its part, not only as an active participant in constructive co-operation among the gas associations of the country, but also as a contributor to the welfare and future development of every phase of the gas business.

The Future.

In considering the future of the Illinois Gas Association, we should not hastily adopt any plan of action without investigating its possible harmful effects, as well as any promise it may give of ultimate good. I speak of this, because their appears to be in the world to-day two systems of co-operative effort; similar, in that each may be made to attain some ultimate benefit, individual or collective; dissimilar, in that one attempts to accomplish by destructive effect what the other endeavors to bring about by constructive work. Destructive co-operation usually means that many things of the present must be destroyed in order that future benefits may be obtained for the survivors and for future individuals or groups. On the other hand, constructive co-operation conserves and transforms things of the present in an endeavor to derive benefits for all, for the present and future.

We have a frightful example of destructive co-operation in the waring armies of Europe, that are destroying human life of the present, each in the belief that it is necessary in the interest of the future. We are told that much good will come at the conclusion of the present great war, to reimburse the human race for the untold sacrifice and destruction. But why all this destructive effort when the same amount of energy wisely expended in constructive co-operation could have advanced the people of the earth with no sacrifice of human life, of character, or of good will? The primal instinct of combativeness is still present in most of us, and too often leads to a system of destructive rather than constructive co-operation. If our instinct to fight must be satisfied, why not direct it into constructive channels, where no one is loser and benefits accrue to all? I would not call your attention to these thoughts were it not for the fact that the events of the day make them of importance to us, not only as gas men of Illinois, but as active units in the broad field of human relations.

It is perhaps unnecessary to speak to gas men of constructive co-operation for what body of men better realize the significance of that term? Many a gas man knows the destructive influence of co-operative efforts to incite ill-feeling on the part of the public towards the corporations, of purely selfish interests of demagogues and ill-advised politicians, for whom and by whom the interests of the public are made subservient, and even of the petty jealousies of employees, which sometimes become paramount and destructive of the interests of the employer.

It is not of these things I would speak; but rather will address you concerning our future constructive co-operation as members of the Illinois Gas Association; because I am certain that, as employees, employers and citizens, gas men can be depended upon to do their duty as constructive agents in the advancement of the peaceful arts, industries and interests of civilization.

The problem before us may be stated in the question: How can we, as members of the Illinois Gas Association, render individually and collectively, greater service to the gas industry and our fellow men, by applying principles of conservative co-operation?

Can we do it by consolidation with other State Associations of like character; or by amalgamation with local organizations concerned with other forms of public service; or is the most good to be accomplished by developing the internal activities of the Illinois Gas Association, and co-operating with similar organizations, while still retaining our individual identity? These questions have been suggested, and may arise in more definite form for your consideration; but for the moment I will only ask your indulgent attention with respect to the problem of improving the activities of our own association.

Not all gas men find it possible to attend and take part in the activities of the conventions of national gas organizations like the American Gas Institute and the National Commercial Gas Association. Many of them, however; are desirous of meeting their fellow gas men and taking part in the preparation and discussion of papers of benefit to the gas fraternity. To meet this want, State and Sectional associations exist, because they make these desirable things possible for those gas men who do not find it possible to spend the time and money necessary to travel long distances. In harmony with this line of thought, I believe it is the function of the Illinois Gas Association to provide local gas men with as many as possible of the advantages obtainable by attendance at conventions of the gas organizations of national scope.

While in the past, the Association has endeavored to render a worthy service to its various individual members, I believe that in the future it should be a recognized policy of the Illinois Gas Association to provide its members, by means of papers and committee work, with annual programs of the broadest possible scope in every branch of the business. In this connection, let us not forget that the interests of our associate members should be given every possible consideration by the Technical Committee in its selection of papers for the annual programs, and that the active members should individually make the convention attractive to their brother gas men.

The future success of our Association work depends, as in the past, upon the constructive co-operation of the members in the preparation of papers and in committee work. The Illinois Gas Association is what you make it, in fact it reflects collectively the various personalities composing it. Therefore, we should all bend every effort to improve our individual selves by study of the progress of others, by research into those problems of the gas industry which we have not yet solved, and finally by service to the Association in the preparation of papers or in committee work. By constructive co-operation of this kind we not only improve ourselves, but our companies and our Association.

Before concluding, I wish to submit for your consideration, the suggestion that the Illinois Gas Association endeavor to bring about more constructive co-operation between the State and District gas associations and organizations of the country. There is already some amount of desirable co-operation between the National and local gas organizations, but between the various State and district gas associations there appears to be practically none One of the advantages to be gained by the co-operation of State and District gas organizations might be a recognized agreement regarding the exchange of proceedings. By a system of this sort, each association would become possessed of a valuable library containing the proceedings of every other gas organization in the country; and much of the valuable information yearly presented in the form of papers, committee reports, etc., to the various gas organizations would become of service to all the gas fraternity. The "Give and ye shall receive" spirit in this connection should prove of value to every gas organization in the country.

I take this opportunity to express my appreciation of the hearty co-operation of the other officers of the Association, and of the earnest labors of the various committees to fulfill the duties severally assigned to them. To those who have prepared papers for this meeting I give my heartfelt thanks. To our entertainment committee I convey my gratitude for its service to the Association; and extend my sincere sympathy because of the loss of one of its members, Mr. Franklin J. Ely, whose untimely demise has caused our Association to suffer an irreparable loss.

In conclusion, it is my earnest hope that, as in the past, the Illinois Gas Association will continue to progress by virtue of its constructive co-operation; and I can leave with you no better wish than that each of you will apply the principle of constructive co-operation, in its fullest significance, in all you do.

Recent Patent Issues.

Prepared for the American Gas Light Journal by Royal E. Burnham, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,160,196. Gas and Air Mixer. F. Peiter, Cleveland, O., assignor to The Gas Machinery Co., same place.

1,160,246. Hot Water Attachment for Gas Stoves. A. Blomquist, Chicago, Ills.

1,160,375. Process of Removing Sulphureted Hydrogen from gases. K. Burkheiser, Fruchthof, Hamburg, Germany.

1,160,486. Gas Stove. E. J. Allen, Albany, N. Y., assignor to Rathbone, Sard & Co., same place.

1,160,391. Gas meter. R. L. Dezendorf, Richmond Hill, N. Y.

1,160,755. Gas Range. M. A. Possons, Cleveland, O., assignor to American Stove Co., St. Louis, Mo.

1,160,836. Purifying Gases of Dry Distillation and Recovering the By-Products Thereof. K. Burkheiser, Hamburg, Germany, assignor to Burkheiser & Co., same place.

1,160,908. Process for the Production of Gas from Bituminous Fuels in Intermittent Operation. P. Koster, Frankfort-on-the-Main, Germany, assignor to Dellwik-Fleischer Wassergas-Gesellschaft, same place.

Disposal of Gas House Wastes.

Paper by PAUL HANSEN, to the Illinois Gas Association.

Persons engaged in the manufacture of illuminating gas, as a rule, do not appreciate fully the objectionable results of discharging unpurified liquid gas wastes into sewers and water courses; partly because they have become accustomed to gas odors, and partly because the wastes give rise to conditions in sewers and waterways that would not be readily anticipated from their appearance. It will be the object of this paper to state briefly the objectionable effects produced by gas house wastes, and to describe methods for preventing these effects.

Wastes vary greatly in quantity and character, due to variable recovery of useful constituents and to the use of variable quantities of water. Generally speaking, the quantity of wastes per million cubic feet of gas manufactured is greater and more offensive in the smaller plants than in the larger ones because of the smaller recovery of marketable products and greater waste due to leaky tanks and defective apparatus.

There is very little reliable information on the quantity of waste liquors from gas plants. From the fragmentary data available it would appear that the volume of wastes from a water gas plant may vary anywhere from 5,000 gallons to 25,000 gallons per 1,000,000 cubic feet of gas produced. Coal gas plants generally produce smaller volumes of liquid wastes than do water gas plants. In most instances the volume of wastes can be greatly reduced by re-using the watery liquors after tar and oil has been partially separated in suitable reservoirs.

Wastes from gas plants are of a brownish yellow color somewhat turbid with more or less tarry sediment and floating oils. The waste liquids from water gas plants are generally clearer than those from coal gas plants, but they carry more light oil and have a more penetrating odor. Odor of gas wastes may always be detected in dilutions up to one in 5,000, and very often in much greater dilution than this, which accounts for the objectionable pollution of comparatively large streams.

The total solids as represented by residue on evaporation vary, according to examinations made by the Massachusetts State Board of Health, the New Jersey State Board of Health and the Illinois State Water Survey, from 1,000 to 52,000 parts per million. For the larger plants where efficient sedimentation tanks are used, the total solids should not exceed 6,000 parts. While this figure represents only six-tenths of 1% of the volume of the liquid, a seemingly very small figure, nevertheless these matters are capable of many ill effects.

One of the most frequent complaints is that of tarry deposits on stream beds, wharves, retaining walls and the bottoms and sides of water craft. The deposits are unsightly, give off odors, especially when the water is disturbed, and render waterways unfit for bathing purposes. When a waterway is also polluted with sewage, the tarry deposits entrain and hold sewage matter, which putrify and add greatly to the nuisance.

When gas wastes are discharged into city sewers the tarry matters adhere to the sides and bottom, sometimes resulting in complete clogging, or in any event seriously interfering with the flow of the sewage, and hence decreasing the capacity of the sewers. This difficulty is so great that sanitary engineers are generally agreed that crude gas wastes should not be permitted in public sewage. The same tarry wastes interfere very seriously with sewage treatment works by adhering to filtering materials and operating devices.

The floating oils in gas liquors spread out on the surface of water causing unsightly appearances and pronounced odors. Oils, especially in wastes from water gas plants, are very penetrating. In this connection it should be remembered that very little oil is required to cover a large surface of water. A drop of oil such as that used in gas plants is sufficient to cover the surface of the water in a full wash basin.

Gas liquors, especially the oils from water gas plants, have a highly toxic effect on fish. Experiments conducted by M. C. Marsh of the United States Bureau of Fisheries, indicated that dilutions of oil from water gas waste as great as one part oil to 400,000 parts of water, proved fatal to perch. The watery wastes and wastes in general from coal gas plants were less toxic, but dilutions as high as one to 100,000 are distinctly dangerous.

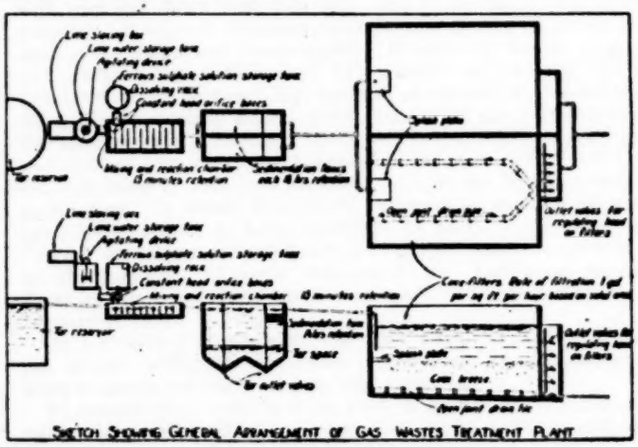
Even much greater dilutions than the above are decidedly objectionable where fish is concerned, in that they impart a disagreeable taste to the flesh. This difficulty reaches very serious proportions at Beardstown, Ills,, where fishing is an important industry. It is customary at this point to keep the fish in "live boxes" along the water front of the city until shipment can be made. Although the gas wastes escaping into the river amount to but a few gallons per day, and although the river is large, entire catches are rendered offensive as food, even after cooking, by a "gassy" taste.

A similar effect on fish has been complained of at Rock Island, where fishermen claim that fish caught as much as 12 miles below the outlet of the gas house drain are at times affected with a "gassy" taste.

Oily films may also act to deprive fish of a proper supply of oxygen, but when oily films are so extensive the concentration is so great that fish are more likely to be killed by direct poisoning. In streams otherwise pollutted, as with sewage, the principal effect of oily films, aside from their own direct offensiveness, is to prevent oxygenation of the underlying water, thereby promoting purifactive decomposition, and thus intensifying nuisances from other causes.

The only extenuation in favor of oily films that can be offered is that when present in sufficient quantity to cover quiescent water, they prevent the breeding of mosquitoes. This circumstance, however, happens too infrequently to be of any great moment.

Much has been said about the germicidal action of gas wastes, but their value in this connection has been greatly over-estimated. While some germicidal effect may exist in the wastes from coal gas plants, it is very slight, and in wastes from water gas plants it is non-existant—in fact these liquids constitute a good culture medium, as evidenced by experiments by Whipple, for the New Jersey State Board of Health, in 1907.



SKETCH SHOWING GENERAL ARRANGEMENT OF GAS WASTES TREATMENT PLANT

In all cases of pronounced stream pollution that have come to the attention of the State authorities of Illinois, gas wastes have been the basis of one of the principal elements of complaint. Along the Sangamon, below Decatur, for example, though the stream is grossly polluted with sewage and wastes from a starch factory, the odor and appearance of gas house wastes some times predominate for miles in a down-stream direction. At Galesburg, the gas house wastes add very materially to the gross pollution of Cedar Fork. In the Cuyuhoga River, at Cleveland, and in the Chicago Drainage Canal, below Chicago, the self-purification of the stream has, at times, been more or less checked by oily films, which prevent access of atmospheric oxygen to the water below. The Passaic River, below Paterson, N. J., is one of the most notable examples of stream pollution by gas house wastes in this country. At Centralia, Ills., much complaint was made of tarry wastes adhering to the legs of cattle, and of the injury to soil and crops by tarry deposits.

Another bad effect of gas house wastes, which has here and there given rise to more or less serious trouble, is the pollution of the soil, which in turn gives rise to gassy tastes in well waters and to gassy odors in cellars. A striking instance of this occured at Joliet, where one of the public water supply wells was affected with a gassy taste, which could be explained on no other basis than contamination from a gas plant near by. The writer had occasion some years ago to observe a similar instances of the long travel of

grassy wastes at the town of Carthage, in Southern Ohio. Here the pollution was occasioned by coal tar wastes used at a tar paper factory. These wastes were permitted to flow into a pit at least 2,000 feet from the affected wells. That large quantities of gas house wastes can enter the ground is strikingly shown by investigations made at the Lowell, Mass., gas works in 1905 and 1906, by A. T. Stafford and H. W. Clark, who estimated that there existed within the ground and within an area of a few acres, 1,600,000 gallons of tarry and oily wastes. Some of these consisted of accumulation in old drains and porous gravel, which, when tapped by excavations, flowed out in springs. Much waste was regularly finding its way into sewers, and from the sewers it entered cellars along the lines of the sewers at even remote distances from the works.

The first step in eliminating nuisance due to gas wastes is to reduce the volume of the wastes to a minimum and keep them well confined in channels and tanks. The volume of wastes should be kept down by re-using water after sedimentation for seal pots, and wherever else permissable; and by a strict separation of rain water drainage and wastes. This is particularly necessary in connection with gas holders. The overflow from gas holder seals is responsible for many cases of stream pollution. An instance of this is a small stream which flows through the campus of the University of Illinois.

After the volume of the wastes has been reduced to a minimum, which may be taken as 10,000 gallons per 1,000,000 cubic feet of water gas, and about 6,000 gallons per 1,000,000 feet of coal gas, then the wastes should be treated for the recovery of tar. This is usually accomplished by the use of tar reservoirs. These reservoirs should be of liberal size, not only to promote a good separation of tar and oil from the liquid, but also to equalize sudden discharges. A tank capable of holding several days' supply is desirable. The effectiveness of the tank may be increased by suitable placing of baffles, to secure complete displacement by the liquid passing from inlet to outlet, and also by heating the tank with steam coils. Very substantial concrete construction is desirable to prevent passage of liquids and tarry matter into the soil.

The effluent from the tar tank should next be treated with a coagulant. Ninety per cent. lime in proportion of 3 or 4 pounds per 1,000 gallons of waste treated is adequate for wastes from coal gas plants, but water gas wastes require coagulation with both copperas and lime to prove effective. Generally 2 pounds of copperas per 1,000 gallons of waste are sufficient.

Correct preparation, storage and application of chemicals are very important items. The lime must be slaked in a suitable slaking box, and the hydrated lime thus obtained must be diluted to form a thin milk of lime (not over 5% in strength) in order to prevent, as far as possible, clogging of pipes, valves and orifices. The milk of lime should be kept in a storage tank of suitable capacity, provided with a stirring device kept constantly in operation to secure a uniform supension of lime particles. Uniform application is secured by means of a small feed tank in which a constant level of water is maintained by a float operated inlet valve, and from which the chemical flows through a sharp edged orifice that should be made adjustable in size. Suitable feed boxes may be obtained from filter companies or they may, with comparative ease, be specially designed and built. Copperas is stored and fed in the same manner as the milk of lime, but being readily soluble, no stirring device is necessary. A convenient way of preparing a copperas solution is to place the crystals in a shallow box with perforated bottom, built in the side of the storage tank near the top, and spray water over the crystals until they are dissolved. A 5% solution is of convenient strength.

To insure an intimate mixture and complete reaction of the chemicals with the wastes being treated, a highly baffled reaction chamber with a retention period of about 15 minutes is desirable.

Following coagulation, the wastes should be permitted to settle for a period of at least 1 hour. Rectangular tanks, with length about three times the width and a depth of 5 or 6 feet, are best adapted to this purpose. It is always well to have the sedimentation tanks in duplicate so that one may be taken out of service when cleaning without disturbing regular operation. The tanks must, of course, be provided with suitable means for tar removal.

As a means for intercepting oil, a coarse coke strainer should be placed at the outlet of the sedimentation tanks. This can most readily be accomplished by building a shallow box with perforated bottom across the end of the tank about 9" below the invert of the overflow channel and 2 or 3 feet in width. The inner edge of the box should project above the level of the liquid in the tank. This box should be filled with nut size coke through which the wastes may pass in an upward direction. When the coke becomes clogged or saturated with oil, it may readily be shoveled out and replaced with fresh coke. The used coke can, of course, be burned under the boilers.

Very often the treatment above outlined will prove all that is necessary, but the effluent will still have some odor, color and turbidity, and perhaps there may be traces of oil. Nevertheless, it should not prove seriously objectionable if discharged into city sewers or into a stream of considerable size.

There are many cases, however, where a higher purification is necessary, and this is very apt to be true in the smaller plants where little or no attempt is made to recover valuable by-products such as tar and ammonia. Under such circumstances, final downward filtration through a bed of fine coke will produce an effluent so free from objectionable matters that it may be discharged into even the smallest water courses without giving rise to offensive conditions. Sand can be used quite as effectively as coke, but the coke has the advantage about gas plants of availability and of being usable under the boilers after it becomes clogged. Suitable sand is not always available, and after removal from the filters it must be permitted to accumulate in unsightly heaps or disposed of at considerable expense.

The filter beds should be made 3 feet or more in depth, of material not coarser than $\frac{1}{4}$" in diameter and free from fine dust. The area of the surface of the filter should be such that the rate of filtration will be about 1,000,000 gallons per acre per day, or roughly 1 gallon per square foot per hour. Under-drains of vitrified tile laid with open joints should be placed across the bottom of the filters at intervals not greater than 10 feet. To prevent clogging of the drains, the joints should be covered with cheese cloth and the tile surrounded with gravel.

The surface of the filter must be kept level, and it should be, if possible, 4 or 5 feet below the level of the outlet of the sedimentation basin, so as to permit this head of water on the filters before cleaning becomes necessary. When the filters become so clogged that water will not pass through them under the head available, the surface of the filter must be removed. Generally the removal of only a few inches of material will be necessary, as the clogging will take place principally at the surface. After successive scrapings have reduced the thickness of the filters to about 18 inches, there should be a deep scraping of at least 6 inches, and then new material should be placed to the original depth. Occasionally, it may be necessary to remove all the filtering material.

Times and means have not permitted the writer to canvass the country, or even the State, to learn what methods of purification are in use and how they are operating. At Lowell, Mass., there is a plant built along the lines indicated above and treating the combined wastes from the coal gas and the water gas processes, which is giving very good satisfaction, and has quite completely eliminated difficulties due to bad odors from sewers entering streets and houses. At Mendota, Ills., is a plant installed under the recommendation of the State Water Survey, but the construction in detail was not carried out as recommended, especially in the manner of applying the chemicals and use of the filter. Nevertheless, the treatment afforded has affected a very material improvement in the condition of Mendota Creek, into which the wastes are discharged.

In conclusion, it may be said that gas house wastes can generally be treated so as to overcome their offensiveness in a simple manner and at moderate cost. The problem at different gas plants unavoidably varies according to local practice, and in important cases it would be desirable, before expending any considerable sum on treatment works, to secure the advice of one who has given special study to purification of sewage and industrial wastes.

An Inexpensive Boiler-Front and Stack Paint.

The Urbana and Champaign (Ills.) Railway, Gas and Electric Co., has found this a serviceable paint on boiler fronts and stacks.

40 gallons coal tar,	5 pounds resin,
5 gallons gasoline,	2 pounds powdered sugar of lead,
6 pounds litharge,	1 quart or more turpentine,
6 pounds plaster of paris,	5 pounds to 10 pounds graphite.

In making up the paint, the litharge and the plaster of paris are mixed with one-half the gasoline, and this added to the coal tar. Next the resin and the sugar of lead are mixed dry and sifted into the liquid mixture, and to this the turpentine is added, in quantities for either slow or rapid drying. Then the graphite, used to give the paint a gloss, is mixed with the remaining gasoline, and finally, all the ingredients are mixed without heat, being stirred continuously and well stirred after the last ingredient has been added. The total cost of the paint should not exceed 40 cents a gallon.

The Ohio Commission's Investigation of Natural Gas Shortage in Cleveland.

From Report by MR. C. V. CRITCHFIELD.

On January 25, 1916, the Director of Law of the city of Cleveland, addressed the Public Utilities Commission of Ohio on a complaint of the City that the East Ohio Gas Company has failed to furnish to the consumers in the City of Cleveland a sufficient amount of gas; and asking an order from the Commission to relieve this situation and prevent its recurrence.

The East Ohio Gas Company furnishes natural and artificial gas in Cleveland and certain suburbs. At the time the utility began its service in Cleveland, the entire supply of natural gas was obtained from The Hope Natural Gas Company of West Virginia, but in later years it secured a portion of its supply from within Ohio, and is now purchasing and producing gas in Ohio in addition to that purchased from The Hope Company.

Besides its natural gas service the company owns and operates modern artificial gas works of large capacity, and the connected distributing system is built in most generous proportions.

The city and suburbs have an estimated population of 700,000 people. The Company has 180,000 connected meters on its lines, with an average of 178,000 active accounts. Its present artificial gas service goes to 5,200 consumers.

During 1915, domestic users of natural gas comsumed 18,773,000,000 cubic feet; industrials, 13,909,000,000; and the 5,200 artificial consumers took 183,620,000. The natural gas is distributed through 6,500,000 feet of mains, and artificial through 3,000,000, a total of 1,800 miles of mains. No other city on the globe depends as largely on gas for domestic heating; and it is served by the largest natural gas distributing utility in the world.

The Hope Field, West Virginia, comprises 419 square miles of mountain and valley.

For operating purposes, the "field" is divided into 14 districts, each in charge of a field foreman, under the direct control of the superintendent of the whole "field," whose headquarters are at Clarksburg. Each field foreman has a force of men whose chief duties are the inspection of gas lines and wells.

The one big problem in producing gas is to market every foot that is jeopardized by proximity of competing producers, and at the same time to hold in the protected well every foot possible for future requirements. Acting on this theory, the Hope Company classified their wells, using as long as possible gas from class "A," located on the border lines dividing disputed territory. The next group lie back from the borders, and are used to augment the output of class "A," when the demand cannot be met by these wells. Another group embraces the wells further back in the field and protected from depletion by foreign wells. This is the reserve class—the veterans in the last "trench," which are relied upon to carry distant distributing companies through the exigencies of "cold waves" and parting lines.

Physical conditions in the "field" are constantly shifting. A new well is "drilled in" each day and old wells drop out. Wells subjected to constant drain must be rested, otherwise their rock pressures become so impaired that they can no longer resist the water pressure. While these changes go on, the demands of the consumer likewise undergo daily changes, due to weather conditions. It is the business of the field superintendent, while keeping up the efficiency of the wells, to anticipate the needs of the gas consumer. A day of mild weather during the heating season so curtails the use of gas that the field organization is obliged to travel over the system and shut off sufficient wells to keep the accumulating pressures from rupturing the field lines. It is a frequent occurence that no sooner are wells closed in, here and there over the "field," than an unexpected change in weather conditions obliges the turning-in again of some part or all of the wells just cut out.

The development of the Hope field to meet increasing consumption, in connection with the gradual fall in rock pressures, has brought about the introduction of compressor stations. In years past the natural expansion of the gas carried it forward to the chief station of the company at Hastings, where it was compressed and driven through 150 miles of trunk lines, connecting the "field" with Cleveland and other northern Ohio cities. To-day, the Hastings station, largest in the world, has become a "booster" plant, for back of it some 15 other compressor stations, located at advantageous points throughout the "field," push the gas to Hastings, where a fresh impetus is given that makes delivery at the city gates. The Hastings station has a normal capacity of 50,000 horse power, and all gas delivered from the Hope field, for Cleveland, passes through its compressors. It is estimated that the combined trunk lines have a safe working capacity of 325 pounds per square inch of surface, which means that into the space occupied by one cubic foot of gas under atmospheric pressure, these compressors crowd 22 cubic feet.

A compressed gas, when released from confinement, expands indefinately, and by reason of the phenomenon of elasticity, it is possible to transmit large volumes through relatively small conduits for long distances. It becomes apparent that the pipe lines connecting the "field" with the market, serves the double purpose of storage and a transmission vehicle; therefore, an ideal trunk line may be said to have such capacity that the demand at no time completely exhausts its store of gas and renders it purely a transporting agency.

Under average conditions throughout the United States, gas transportation companies find that in each twenty-four hours, there are five or six during the night in which to pack the lines. This "pack" or storage is relied upon to assist the compressors in carrying the load through the remaining eighteen hours.

In the Lakewood and local field during the summer of 1912, the Winton Motor Company drilled a gas well near its factory but produced little gas, and the well was abandoned. Soon after, another well was put down less than fifty feet from the Winton on the property of Marcus Monahan, and is now spoken of as the first well in the Lakewood development. It came in during August, 1912, with a rock pressure of 925 pounds and an open flow of 3,000,000 cubic feet per day, but was abandoned in December of 1915, after producing some 456,000,000 feet of gas. The strike in the Monahan well stimulated operations in the neighborhood, and well drillers from everywhere flocked to the new "field," but they did not come in sufficient numbers to meet the requirements of prospectors. It would be a liberal estimate to mention 25 wells judiciously located as being sufficient to properly develope the "field," and this at a small fraction of the investment represented by the hundreds of wells throughout the Lakewood district. Seven hundred and forty-three local wells had been drilled up to January 1, 1915.

On February 1 of this year, the East Ohio was taking the output of 485 wells; the remainder representing dry or abandoned wells or producing wells used by local factories.

To connect these wells by a net work of gathering lines has cost the utility over $200,000, a sum that would build an ordinary natural gas system in a city of 25,000 people.

THE SHORTAGE.

Monday, January 17, the first day specifically named in the complaint of January 25, was intensely cold and windy. At 1 A.M. the temperature in Cleveland was 5° above zero; at 2 A.M. it had fallen to 2°; at 3 A.M. to −1°; at 4 A.M. to 2°, where the mercury held until 9 A.M. when it rose slowly to + 1° and from there gradually to 15° at 3 in the afternoon, when it began to fall slowly up to eleven o'clock Monday night, where it reached + 7°.

Tuesday, January 18, presented a minimun temperature of +9° at 1 A.M.. with a maximum of 24° at two in the afternoon. During Wednesday, January 19, temperatures ranged higher and practically terminated the "cold wave" and prevailing low gas pressures.

On Sunday, the 16th, the transmission lines between the Cleveland terminii and the Ohio River, were "packed" to capacities, and the huge battery of compressors at Hastings maintained this line condition until noon on Monday, in the face of the tremendous drain of the attempts of Cleveland's population to combat zero weather aggravated by a Lake gale.

At noon it became apparent to the officials of the company that the "field" would not be able to meet the combined domestic and industrial demand, and hurried notices were given to manfacturing plants to discontinue the use of gas, but before any appreciable curtailing results were secured, the draw on the line exhausted the gas "packed" in the transmission trunks, and pressures at the

Cleveland gates fell below the safety margin of 45 pounds. Conditions grew steadily worse, until ten o'clock Monday night, and from then sub-normal pressures were held by the combined local and West Virginia "fields" for 24 hours. At 11 o'clock Tuesday night, the pressure guages at Hastings indicated for the first time that the station was slowly overcoming the demand, and by late Wednesday morning adequate pressures throughout Cleveland were restored.

The shortage reached an acute stage in two sections of the city; the first and largest occuring in the East side in the section bounded by 54th street, Euclid avenue, 105th street and the Lake. The other section was in the West side,—bounded by Detroit street, 25th, Dennison and 16th streets.

Second Complaint.

On February 8, Director of Public Service telegraphed the Commission as follows:

> "People are again complaining of gas shortage. Have Critchfield come to Cleveland at once to complete investigation."

From interviews with persons whose complaints appeared in one of the Cleveland newspapers, I concluded that there had not been another shortage similar to that of January 17 and 18. In fact, local conditions in most instances were responsible for the apparent lack of gas, the chief of these being inadequate house lines, particularly noticeable in old apartment buildings; improper furnace connections; adjustments and damper regulations, and houses located on dead street ends. Some of the complaints proved to refer to the January shortage and others related to excessive bills.

The Cause.

The cause of this first shortage was the inability of the combined field and transmission lines to furnish with sufficient promptness, January 17th, as much gas as the domestic and industrial consumers were trying to use. Had all industrials been disconnected on Sunday, there would have been ample supply for the domestic consumers until the abnormal demand was ended by the milder weather on Wednesday.

From reports from industrials, I find quite a few were shut off during the previous week, and the company assumed that the load had been sufficiently reduced to protect the domestic service, but the sudden severe "cold wave" of Sunday night upset the company's calculations with the results already detailed.

Remedies.

No utility furnishing a natural gas service in a large and rapidly growing city and distant from its main source of supply, can so anticipate each and every prospective consumer's needs by field development and construction of transmission and distributing lines, as to give ideal service. Natural gas service, to be ideal, must meet the three requirements of being instantaneous, adequate and uninterrupted. A normal and reasonable service fails the ideal, as the street car company fails when some patrons stand; as the telephone company fails when the "line is busy," as the merchant fails with too few clerks to instantly serve his customers.

Reasonable gas service demands, in so far as the utility's rates permit, the use of every facility that will raise the standard of service to an approximation of the ideal.

Coming directly to the city's complaint, I believe the local field is, under all conditions, and will continue to be, a prolific source of trouble and cause of shortages. The situation is unique, in that there is a large volume of gas which the utility is obviously obliged to buy and over which it has no control; and because it has no control so long as it can make use of the gas, it becomes relatively the main, although the minor, source of supply. The major source —the Hope field—has become the reserve. It is for the West Virginia field to adapt itself to the vagaries of Cleveland weather. In place of using the local nearby, easily and quickly handled supply, for emergency purposes, the utility is attempting to make flexible the ponderous, inelastic distant field, in order to meet the demands that arise within the hour. Had the utility an independent control of the local field, it would make an ideal source of supply, held in and conserved as an auxiliary to use during the 10 or 15 days in the average year when long transmission lines from remote "fields" are unable to meet the demand.

A second contributing cause is the continual operation of the utility's artificial works to serve a handful of consumers with manufactured gas. By reason of this business, the utility is deprived of the use of large holders for storing natural gas, and the large artificial mains which are restricted to the distribution of manufactured gas. As it so happened the sections of the city most affected by low pressures are in close proximity to these holders, and had they been stored with natural gas instead of artificial, 4,000,000 cubic feet at the East End works would have been available to reinforce the failing supply throughout the congested residence district east of 57th street, on the night of Monday, January 17th. Three million more could have been thrown into the depleted lines of the West End.

A third contributing cause, in so far as the domestic service was affected, is the industrial consumer.

Primarily the East Ohio Gas Company exists to serve the domestic consumer, secondarily to sell surplus gas to industries. Surplus gas is that portion of the utility's available supply not required to serve the domestic consumer. During some portion of the days on which a shortage is complained of, the utility was permitting the consumption of a fictitious surplus. Whenever the utility finds it has more gas than its domestic consumers can use, it is the proper and economical thing to dispose of excess gas, in fact, under the existing traffic in natural gas throughout the United States, the utility would be neglectful in not seeking a market for the excess, as the revenue derived from such enables a lower rate on domestic sales.

The past winter has been a season of rapid and widely varying changes of temperature; and it was a difficult undertaking to quickly adopt a ponderous producing and distributing system to the varying demands imposed by weather conditions of the past two months. Cleveland was not alone in experiencing inadequate gas supply, Toledo, Buffalo and Pittsburgh were similarly affected.

Viewing the industrial consumer phase of the Cleveland situation, I think it possible that the utility in an endeavor to keep step with the giant strides of a big city's growth has unconsciously overreached; and until the company developes a local production of its own, over which it has absolute control to use or let alone, that it is taking long chances with its domestic service in accomodating industrials during the heavy residence heating season of the year.

Other contributing causes lie with the consumers. I have aready referred to the large residence heating business done in Cleveland. The practice of turning furnace fires off or low, at bedtime, and relighting in the morning, is shown by the hourly demand curve. In the two hours from 5 A.M. to 7 A.M. the consumption of gas rises abruptly 300%; caused by heating patrons acting on the belief that they are saving gas. The truth is that no gas is saved, in fact, the attempt to quickly raise the temperature of a cold house results in an inefficient combustion of fuel. This sudden draught on street mains often cannot be met and an apparent local shortage follows.

Another practice is replacing a small dwelling by an apartment building, without enlarging the service lines. Furnaces are connected to house pipes originally planned for illuminating purposes only; natural gas is substituted for artificial without altering piping; heating appliances are used without adequate flues to carry off products of combustion, resulting in charging air with vapors which produces an impression of cold to the occupant. These are a few instances where the consumer could co-operate with the utility in the direction of an ideal service.

It is quite feasible for the governments of Ohio, Pennsylvania and West Virginia, through their utilities commissions, to take concerted action on the appaling use for manufacturing purposes made of nature's perfect fuel. It seems nothing short of criminal to permit open hearth furnaces, and other large gas consuming devices, to dissipate this great natural product.

Recommendations.

He offers these suggestions based on the investigation:

1. That the East Ohio Gas Company make every possible endeavor to provide a production of its own, near Cleveland, and to hold same for emergency needs.
2. That it recognize the danger of jeopardising its domestic service by attempting to supply large industrials during the heavy residence heating season, under the conditions imposed by the local "field" in its relation to the West Virginia "field" as heretofore detailed.
3. That the city, by proper legislation, place the utility in position to utilize its artificial system for natural gas service.
4. That the utility install "pitot tubes" or "orifice meters" at the Cleveland terminals of its transmission lines, that it may secure frequent gas measurements for its own and the Commission's information.
5. That the utility install recording pressure gauges in each distributing district, that it may have an indisputable pressure record of the entire city for its files and the information of the Commission.

Telephone - John, 2996.

THE AMERICAN GAS LIGHT JOURNAL

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SANFORD K. CAMPBELL, Editor.

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CHARLES H. WADELTON, Secretary and Manager.

NEW YORK, MONDAY, APRIL 10, 1916.

A Hymn of Hate.

The big men in the industry have for some time realized that healthy competition between gas and electricity acts as a welcome stimulant. Wilful falsehoods hurt the cause of either, and such tactics are seldom used. The recent publication by the Westinghouse Company, referred to in our review of current publications in this issue, has no excuse for being. It was hardly expected that the committees of either the gas or the electric associations that have to run-down misleading advertising statements would have such big game to chase. It is to be hoped that Gas Men will see to it that the officials of that corporation do not remain in ignorance of their feelings toward the sponsors of such unworthy propaganda.

New York Section Meeting I. E. S.

The attendance record was broken at the meeting of the New York Section of the Illuminating Engineering Society, held on the evening of April 6th, at the Engineering Society's Building, New York City.

Chairman D. McFarland Moore introduced the speaker as an expert on many topics, ranging from socialism to astronomy, Dr. Charles Proteus Steinmetz, president of the Society.

In his opening, Dr. Steinmetz attacked the selected subject, "General Problems of Illumination Design," by stating that illumination was not simply a branch of applied science (physics); as the effects have to do with our physical well being (physiology), and success or failure, a mental condition (Pschycology). Continuing, he said that the variety of uses to which light was put was very well exemplified in domestic lighting; where we wanted low intensity general illumination to provide a restful condition, high intensity general illumination when we desired to find something, and high intensity local plus low intensity general illumination for reading.

The three objectionable features of lighting were named as Glare, Fatigue and Association. Glare is objectionable due to excessive intensity of luminous area, either actual or relative. Fatigue may be produced in a number of ways; by over exertion for a short period, too extended a period of ordinary use, not enough light, or shadows eliminated by too much diffusion. The lighting conditions that best avoid fatigue are those providing just enough of illumination, shadows and contrast. Association, termed as an objection, means color effects that give an unpleasant impression.

Color, he said, was the least studied of the phenomena of lighting. With the new gas filled lamps the efficiency is relatively so high that absorption glasses or screens may be used and still get illumination at reasonable cost. In nature, yellow, brown and reddish brown, are the predominating colors, and therefore the ones that are the most restful. Successful artificial lighting must include a source that contains a sufficient proportion of the ordinary colors found in nature, so that proper color values will be reflected to the eye of the observer; the light must be of sufficient intensity, be shaded and have proper direction so that shadows and background will give ease of vision and proper proportion.

In the discussion, Mr. Norman Macbeth called attention to the fact that frosting a lamp bulb did not give sufficient protection from glare, as the ill effect was pronounced in either case.

Mr. Preston S. Millar announced that the lectures on Illuminating Engineering to be given under the joint auspices of the Society and the University of Pennsylvania would begin on September 21, following immediately after the annual convention.

Among the gas men noted in the audience which numbered over 300, were Messrs. A. H. Strecker, W. H. Pettes, H. D. Gillingham, Emil Korthaus, A. C. Lord, E. H. Schmidt, A. R. Beal, J. M. Coles and A. M. Berg.

N. C. G. A. Directors' Meeting.

The March meeting of the Board of Directors of the National Commercial Gas Association was held at the Hotel Traymore, Atlantic City, N. J., with the following present: Jansen Haines, President, W. W. Barnes, C. A. Munroe, C. E. Bartlett, Arthur Hewitt, J. B. Myers, H. S. Schutt, W. Griffin Gribbel, T. M. Ambler, R. R. Young, Louis Stotz, Secretary, and by invitation of the board, Percy S. Young, George S. Barrows and C. W. Wardell.

The special committee appointed to supervise the work of Wm. A. Ehlers, Industrial Fuel Specialist of the Association, reported a schedule of rates and conditions governing his services, which were approved by the Board.

The Board approved the plan for offering the members of the Association $500 in prizes during the coming year and an appropriation of $25 for a prize to be awarded for the best acceptable suggestion for a national trade mark or slogan that could be used by gas companies and appliance manufacturers.

The Board referred back to the Board of Educational Control the matter of supplying the educational courses to the Massachusetts State Board of Education.

Mr. R. R. Young, Chairman of the 1916 Papers Committee, reported a tentative program had been prepared for one session to be devoted to Illumination; one to Merchandizing, and one to Industrial Fuel and Hotel Appliances; and there would be parellel sessions for industrial men to discuss their problems. Arragements were being made for a composite paper by a number of manufacturers of gas appliances on the subject of retail selling and merchandising.

A paper will be prepared by W. H. Pettes on the subject of office practice as it affects merchandising; one on the adaptation of surface combustion is to be presented, as well as a talk by H. O. Loebell on Industrial Fuel Business, and papers covering hotel, restaurant, institution and club installations.

In the Illumination session it is proposed to have a report from the Illumination Committee, followed by papers on Burner Maintenance, Adequate Piping of Houses, Replacing Old Types with Modern Fixtures, Factory Lighting and Store Lighting.

There will also be a paper on Graphic Presentation of Results, by S. C. Tarrant; and one on Auxiliary House Heating, by George S. Barrows, Chairman of the Auxiliary Heating Committee.

The Board adopted the report of the Papers Committee, and empowered them to go ahead with the program as outlined.

The Association having been approached to take membership in the National Association of Railway Commissioners, an association particularly devoting its efforts to the accounting fields, it was decided to refer the matter to the American Gas Institute.

The Secretary stated that he had had some correspondence with Mr. G. N. Lee, of Boston, in regard to the N. C. G. A. standing sponsor for supplying information and data in regard to gas matters. It was decided that the Association should do all in its power to supply such information as may be called for, and the Secretary was instructed to communicate with Mr. E. N. Wrightington and Mr. Lee in regard to the matter.

It was also decided that the Chairmen of the various Committees should be asked to make monthly reports of the progress of their committee work to the Board.

It was decided to hold the next meeting of the Board the early part of May.

[Special Telegraphic Report.]

EIGHTH ANNUAL CONVENTION, SOUTHERN GAS ASSOCIATION.

TAMPA, FLA., Anril 5th, 1916.

At 6:30 this morning an army bugler sent the "wild echoes flying" down the corridors of the great Tampa Bay Hotel, and called from their beds 150 gas men.

At 7:45 the get-together breakfast began, and shortly thereafter Mayor McKay told us, in warm words of welcome, that he had heard much of us through Rosco Nettles, and, being very fond of Mr. Nettles, he was prepared to believe the many good things he had heard about the members of the Southern Gas Association.

After the response to the remarks of the Mayor, we finished our breakfast and fared forth to enjoy the balmy air and wonderful Florida sunshine of a perfect day.

At 9:30 all gathered in the Casino, and President Dexter got down to business by calling for the reports of the different committees. The Secretary's report showed the Association now has 260 members, does not owe a dollar and has plenty of money in its strong box. The committee to investigate the maintenance situation in the South, made a report prepared by F. L. Marshall of Augusta. The $6,000,000 Augusta fire occurred in March, and although Mr. Marshall lost everything in his home, as well as his office, he remembered the report he had written, and made an excellent replica, which will be referred to a committee for further action.

The Committee on Street Lighting was ordered to continue its work and report at the 1917 meeting; which Roanoke. Va., claims will be held in their new million dollar hotel and auditorium.

President Dexter read an interesting and instructive presidential address, which was referred to a committee consisting of Messrs. Ferrier, Congdon and Zeek.

Secretary Louis Stotz, of the National Commercial Gas Association, addressed the Convention on the work of the N. C. G. A.

The first formal paper considered was that on "Inclined Chamber Retorts," by H. J. O'Rourke. It brought out a spirited discussion and won high praise from all.

"Industrial Fuel Business," by S. Tully Willson, was the next paper read, and no one failed to be interested in it. His plea was for efficient appliances.

This filled the time until adjournment for luncheon; and at two-thirty we started on a round of inspection of the big cigar factories of Tampa—some smokes.

The informal dinner to the members and their ladies', under the direction of the Tampa Rotary Club, started at seven-thirty and kept moving right along. They gave us a wonderful entertainment—something we won't soon forget. B. R. R.

[OFFICIAL NOTICES.]

Pennsylvania Gas Association.

OFFICE OF THE SECRETARY,
WEST CHESTER, PA., March 20, 1916.

The Pennsylvania Gas Association has a cordial greeting for its members this year at Easton, Pa. The eighth annual gathering of the Association promises to go on record as one of the most instructive and important in the history of the organization. Our President, Mr. B. F. Cresson, is not only proud to have Easton open its hospitable doors to the Association, but is also proud of the organization that is going to honor Easton. The industrial establishments throughout the territory of which Easton is the center, will enable the members to see some of the latest installations where gas for fuel is playing such an important part in the production of munition output.

Important papers will be read, covering the latest developments in designing and selling gas lighting fixtures; also the most up-to-date selling methods for appliances. The list of papers and topics show the importance of every member putting aside his ordinary affairs for a day or two to attend this meeting.

The general program, as outlined by the Committee, is as follows:

Tuesday, April 11th, 6 P.M.—Council meeting, with dinner, as guests of the President—Pomfret Hall.
Wednesday, 10 A.M.—Business Session—Heptasoph Hall.
Wednesday, 3 P.M.—Automobile trip about Easton and new industrial plaints.
Wednesday, 8 P.M.—Banquet.
Thursday, 10 A.M.—Business Session.
Thursday, 2 P.M.—Business Session.
Thursday, 8:30 P.M.—Informal Smoker.
Friday, 10 A.M.—Business Session.
Friday, P.M.—Open for Challenge Game of Base Ball.

The Entertainment Committee are planning for a wide-awake, up-to-the-minute good time, starting Tuesday evening for the early arrivals.

On Wednesday, Thursday and Friday, the business sessions will include the following topics:

Short Talk on Public Relations, by J. B. Klumpp.
Report of Gas Fixture Committee, by W. A. Morris, Chairman (including Standardizing of Gas Fixtures, Co-operation with Gas Fixture Manufacturers, Merchandizing of Gas Fixtures).
Lighting Maintenance, by H. H. Newman, Passaic, N. J.
Service Combustion Lecture, by Dr. Lucke.
Thoughts on Merchandising by a Gas Company, by J. B. Myers.
Methods and Costs of Connection Appliances, covering Dispatching, by Oscar Heckert.
Transportation, by L. R. Dutton.
Box System, by George B. Bains, 3rd.
Inspections, by Howard Hoffman, Ardmore, Pa.

There will be a trip on Wednesday afternoon through the industrial plants of Easton, as the guests of the Easton Gas Works; and a banquet on Wednesday evening. On Thursday evening a smoker, "As-You-Like-It," will be an innovation in the usual form of entertainment.

The headquarters will be at the Hotel Karldon. Address all requests for information to E. G. Holzer, Chairman Entertainment Committee, Easton, Pa. Remember the dates, Wednesday, Thursday, Friday, April 12th, 13th, 14th, 1916.

The annual meeting of the New Jersey State Gas Association will be held on April 13th, at Easton, Pa., is conjunction with the Pennsylvania Gas Association.

At this time the annual election of officers will take place. The contribution of the New Jersey State Gas Association to the Pennsylvania program, is a paper on "Residence Lighting Maintenance," by H. H. Newman.

A large attendance is promised, and it is expected that a very enthusiastic meeting will be held.

Indiana Gas Association.

OFFICE OF THE SECRETARY,
NEW ALBANY, IND., March 24, 1916.

The annual meeting of the Indiana Gas Association will be held at the Claypool Hotel, Indianapolis, on April 25th and 26th, 1916. The papers to be presented are as follows:

"Analysis of Gas Company Consumers' Accounts," by V. V. Smith.
"How May Gas Companies Obtain More Wholesale Gas?" by C. A. Munroe.
"Publicity and Advertisement," by J. E. Burke.
"General Consideration of Coal Carbonization Methods," by Vernon Baker."
"Financing Public Utilities Under State Control" and "Service Rate and Rate of Return," by Chester P. Wilson.

On the evening of March 25th, a banquet will be held at the Claypool Hotel.

It is urgently requested that every gas company in Indiana send representatives to attend our Association meeting. Members of kindred Associations are invited to attend and will be made welcome.

JAMES W. DUNBAR,
Secretary-Treasurer.

The Circulating Tank Water Heater.

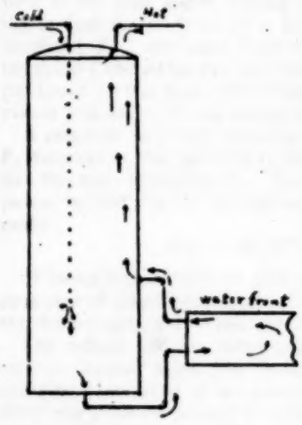
At the regular monthly meeting of the Employees' Association of The Newton and Watertown Gas Light Company, at the Newton works, a talk on "Water Heating by Gas" was given by Mr. E. S. Stack, of the Stack Heater Company, Boston.

Mr. Fancy introduced the speaker of the evening, stating that the object of the meeting was to bring out ideas that would be of practical value to the members of the Association in their work.

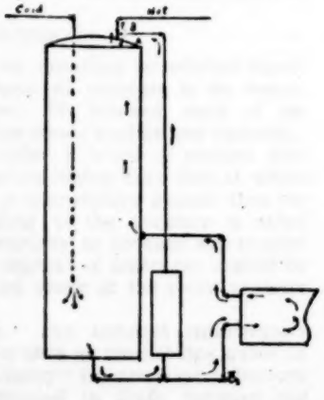
The tank heater and its installation, and its application to various conditions received the most consideration. The talk was illustrated by the stereoptican.

Mr. Stack began by saying that because the tank heater would in many cases replace the coal stove water front, it might be well to consider the work the water front does and the service it renders, by way of comparison with the tank heater.

The first picture shown was of the range boiler and waterfront, indicating the circulation of water by arrows. It was pointed out that if the pipes between the range boiler and the waterfront were of brass they were very seldom effected by sediment, but the waterfront was subject to trouble from this source, as on account of the enlarged area it was not possible to keep it entirely clear by the circulation of the water. It is usually the aim of the manufacturer of the stove and waterfront to furnish heating surface enough to heat the contents of the range boiler and store the required amount of water in advance; and at the same time not to over heat the water if none is drawn. This is accomplished more or less satisfactorily, because the fire in the coal stove is burning from 10 to 15 hours a day, and the usual size range boiler is intended to be large enough to supply the greatest amount of hot water likely to be required at any one time. The waterfront is usually connected from the bottom of the boiler, and to the side coupling, which necessitates heating practically all of the water in the boiler before hot water can be furnished at the faucet; whereas the gas heater is usually connected from the bottom and to the top of the boiler. The object in connecting the gas water heater in this way is to permit the heating of small quantities of water for immediate use, without the necessity of heating practically the entire contents of the boiler.



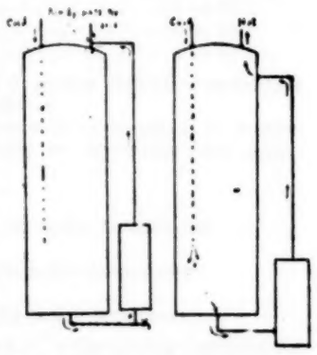
At this point, the question was asked, "What objections would there be to connecting the coal stove to the top of the boiler, similar to the gas water heater connection." The answer was that there would be an element of danger if the coal stove was so connected. In many cases the water might be shut off, and lower the water in the piping and boiler to the point where a small vent hole is usually drilled into the tube which leads the cold water down into the boiler. This would break the water connection between the water front and the boiler, and with a coal fire going, steam would accumulate in the water front, causing considerable trouble, if not damaged by an explosion. It is common practice to leave the house with the coal fire burning, whereas it is practically never done with a gas water heater. Furthermore the gas water heater could be turned out instantly by the control valve, whereas a coal fire cannot.



The next picture shown was a coal stove waterfront and gas water heater connected to a range boiler, indicating the different methods of connecting them. Connecting the gas water heater from the bottom of the boiler and to the top, introduces a new condition whereby it is possible for cold water entering the boiler near the bottom to pass out through the pipe leading to the gas water heater and up through the heater and piping to mingle with the hot water drawn off from the top of the boiler. The passing of the cold water from the bottom of the boiler around through the heater and piping is called "By-passing" and has been a source of much complaint and trouble, usually indicated by luke warm water, or a complaint that the heater did not heat the water hot enough, or that the water did not stay hot long.

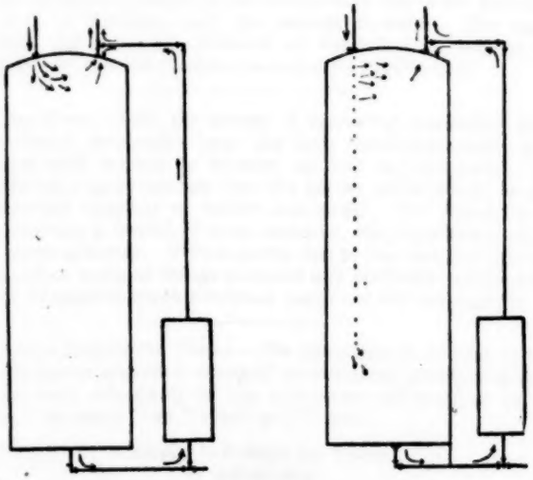
The arrow "A" shows the course of the water when the faucet is closed, and "B" shows its course when the faucet is open. This picture shows quite clearly that it is possible for the cold water to pass out of the bottom of the boiler and mingle with the water previously heated.

This sketch represents two methods of installing tank heaters, recommended as a means of preventing by-passing. The left-hand one shows the heater connected to the side of the boiler near the top. While this method of connecting prevents by-passing, it compels the user to heat more water than is wanted if only one or two gallons of hot water are required. The other way for installing a tank heater is to use a non-by-pass-tee where the pipe leaving the heater connects with the hot water pipe on top of the boiler. This tee will not only prevent by-passing, but will allow the user to heat as little water as required, and draw it off. It will also allow the hot water to pass from the heater directly to the faucet without entering the boiler and mingling with the cold water therein.



It was made clear that if the hot water faucet were open, the non-by-pass-tee would permit the hot water to come directly from the heater to the faucet, which, of course, could not be done with the heater connected at the side of the boiler near the top. The object in using a tank heater is to heat the water as rapidly as possible, and in just such amounts as required; the more convenient, efficient and speedy the service can be made the better.

Next Mr. Stack went into the mistakes frequently made in installing tank heaters; first showing the heater connected to a boiler without the cold water tube. It was shown that while the tank heater would do its work properly, that is heat the water in the tank, yet as the hot water was drawn off, the cold water coming into the boiler would mingle with the hot water at the top of the boiler and thus destroy the hot water service.

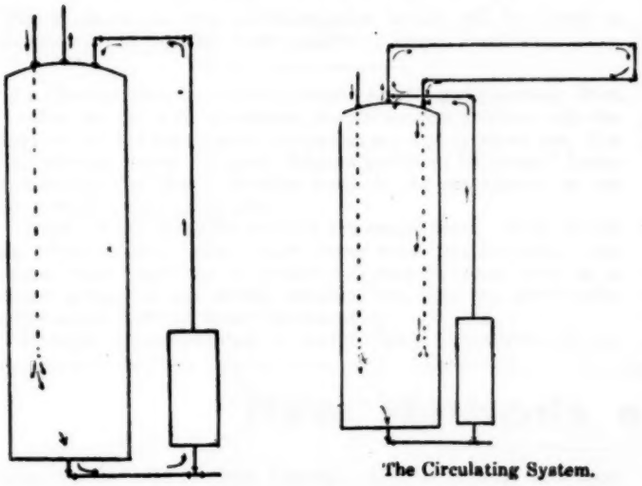


The next picture showed the effects of a split tube. Mr. Stack stated that some copper boilers are furnished with a thin copper tube, and sometimes this gets out of place at the top, or is found to be split, which, of course, had a considerable effect in cooling the hot water in the top of the boiler. Too large a vent hole in the tube, which is usually put in at a point near the top, will also

have a cooling effect on the hot water, especially if the requirements are for small amounts—for dish washing and the like.

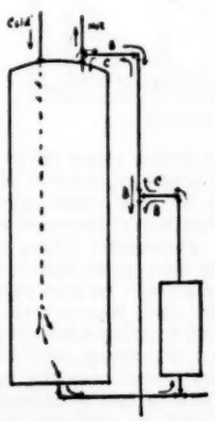
The next view shows a heater connected with a loop, which forms an air pocket in the top of the elbows. If the loop is not too deep, possibly this kind of connection would work, but it is not a good method to adopt and is very liable to give trouble, especially on low pressure or where water could not be drawn rapidly from the boiler, because there would not be sufficient force for the movement of the water to move the air trapped in the loop. The way to correct this trouble would be to connect the pipe from the heater to the hot water pipe, or the loop might be vented by a small size pipe leading from the nipple, between the elbows, to the hot water pipe to the faucets, thus allowing the air to pass off through the hot water pipe when the faucet was open.

Mr. Stack called attention to the trouble which takes place when a heater is connected to the cold water pipe instead of the hot; and while this is unpardonable, it is done occasionally.



The Circulating System.

He next described a circulating system of plumbing and the service it gives. It was shown that in the circulating system, it was intended that heat should be supplied from the coal stove which was in service practically continuously, thus keeping a hot water supply stored at all times. If the gas heater is attached to this system and the heater run for twenty minutes to half an hour, which would be ample time to heat water for a bath, the hot water will pass up through the circulating system and be returned to the bottom of the boiler, thus greatly reducing the hot water service. Even if the water is heated and not drawn off practically immediately, a great deal of it would be lost through this system of piping. It was recommend that a valve be placed in the return pipe, near the boiler, which could be closed when the gas water heater was used, and prevent the water from flowing through the circulating system, compelling it to remain in the top of the boiler so that it could be drawn off at the fixtures as required; although it was cited that this would mean that all the water in the piping between the boiler and the faucet would have to be drawn off before hot water could be had, whereas with the circulating system, the water was on hand instantly. Yet in most cases it is advisable to use the valve with the gas water heater; opening the valve when a coal fire is used, to allow the circulating system to operate. The use of the gas heater on the circulating system might be considered too expensive for general use, but if the valve is used it would tend toward a reduction of the gas bill.

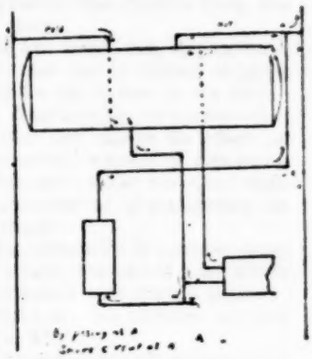


Mr. Stack then showed a picture illustrating what is called "Short Circuiting." That is, where the tank heater is connected with the hot water pipe below the top of the boiler, allowing the water to travel as shown by the arrows in the drawing.

When no water is being drawn and the heater is in operation, the arrow "C" shows the direction of the water flow on its way to the boiler. The heater would heat the water in the boiler all right; but when the faucet is opened the water would take the course indicated by the arrow "B," passing from the bottom of the boiler up through the heater and mingling with the hot water flowing from the top of the boiler on its way to the kitchen sink or laundry; thus preventing good hot water service at these fixture, whereas the hot water service in the bathroom and at the fixtures in the floor above was O.K.

The remedy suggested for this was to run the pipe from the heater up to the top of the boiler and using a non-by-pass-tee; then taking the hot water pipe that runs to the sink and trays from above this fitting. This would give good hot water service at any fixture in the house.

The next picture Mr. Stack showed, was of a horizontal boiler installation, illustrating some of the more common wrong methods of installing as well as the proper method. It was pointed out that the service of hot water from a horizontal boiler, especially the small amounts, would not be as good as from a vertical boiler because the hot and cold water were in contact over a greater area, and if small amounts of water, say two or three gallons, were heated and stored in a horizontal boiler, it would also be subjected to a larger area of radiation than in the vertical boiler, which, of course, has a cooling effect on the water. Mr. Stack showed some forty slides in all, continuing to point out defects of installation and their corrections, as well as the different kind of services that could be had from various types of heaters.



During the talk many questions were asked by the audience and Mr. Stack promised to answer any questions sent him.

Economics of Stoker, Economizer and Superheater.

Labor is one of the most important items in boiler-room operation. In some plants the coal must be handled three times before it reaches the fireman, and the ashes four times before final disposal. Stoker firing saves as much as 40 per cent of the labor in large plants, when used with modern coal storage and coal and ash handling machinery. In plants burning about 100 tons of coal per week the saving in labor is about 25 per cent. A stoker installation without automatic coal and ash handling apparatus would result in little saving, but greater fuel economy would be produced by the stoker permitting the burning of cheaper grades of fuel.

No stoker, however, will satisfactorily handle all classes of fuel. As a general rule, stokers of the front-feed type will give excellent results with better grades of coal but will not satisfactorily handle bituminous coals rich in sulphur. For these, the underfeed stoker, or some form of chain grate will give better results. Fuels with a high percentage of ash can be more easily handled by the chain-grate type.

The upkeep cost will be higher for the stokers than for hand-fired furnaces. Under ordinary conditions the upkeep per stoker per year should not exceed $30; one manufacturer of underfeed stokers gives figures for 319 stokers, with average repair cost per year per horse power rating of stoker of $0.0357. This cost is influenced by the size and composition of the fuel used; sulphur in the coal in the form of pyrites will produce clinkers, and interfere with the stoker operation.

It is difficult to express the cost of a stoker equipment by a single equation; the draft conditions, the class of fuel burned, and other considerations cause variations. The following equations apply approximately to equipments for not more than four boilers, the cost expressed in terms of the boiler horse power:

1. Chain-grate stokers:

For boiler capacity of 300 b.-hp. or less,
Cost in dollars = 86 + 4.2 times the boiler horse power.

For capacities from 300 to 500 b.-h.p.,
Cost in dollars = 450 + 3 times the boiler horse power.

2. Mechanical underfeed stokers:
Cost in dollars = 400 + 3 times the boiler horse power.

3. Mechanical front-feed stokers:
Cost in dollars = 325 + 3.2 times the boiler horse power.

Economizers.

Of the heat liberated by combustion of the fuel in the furnace of a boiler, 10 to 15% passes out of the chimney, but all of it cannot be considered wasted, as the draft is dependent upon the temperature conditions inside and outside the stack. The function of an economizer is to utilize part of the heat in the flue gases on their way from the combustion chamber to the stack.

In considering the installation of an economizer, it is necessary to take into account the loss in draft, the probable cost of draft apparatus and its up-keep, as well as the gain from an increase in temperature of the feed water.

The saving in fuel due to increasing the feed-water temperature is expressed as follows:

$$\text{Heat saved (per cent.)} = 100\,(T - t) \div [H - (t - 32)].$$

T being the temperature of feed water after heating, t temperature before heating, and H the total heat above 32° F. per pound of steam at boiler pressure.

Assuming boiler pressure of 100 pound gage and the temperature of the feed water leaving the economizer as 285° F., the saving in fuel varies from 21% for an inlet feed temperature of 32°, to about 11% for inlet feed of 175° F. As a rule the inlet temperature t should be not less than 100° F., because of the sweating produced on the first row of tubes, which may result in rapid corrosion and short life of the economizer.

A common rule is to consider a fuel saving of 1% for each 10° F. increase in the feed-water temperature, and a 20° reduction in the flue-gas temperature. The increased available boiler horse power by the use of an economizer can be expressed by the formula:

$$\text{Hp.} = W\,(T - t)\,S \div 33{,}479.$$

W being the weight of flue gases passing per hour, T the temperature of gases entering, and t the temperature of gases leaving the economizer, and S the specific heat of the flue gases.

The weight and the temperature of the gases entering the economizer depend upon the firing conditions, and each installation must be considered as an individual problem. An economizer will show the greatest saving in a boiler plant that is forced and which has a high rate of evaporation. It is usually not advisable to install an economizer in small plants.

In the majority of power plants the economizer takes care of the entire boiler room load, but a separate economizer for each boiler is preferable. Besides producing a saving in fuel, the economizer offers an advantage in cases of a sudden demand for steam, because of the quantity of hot water held in storage.

From 4 square feet to 5 square feet of economizer heating surface should be provided for each boiler horse power, and the heat transmitted per square foot per degree difference per hour is commonly taken as 3 B. T. U., with tubes free from scale and deposits.

Data for Economizers.

Number of tubes	32 to 10,000
Heating surface per tube	12 to 13 sq. ft
Capacity in pounds of water per tube	60 to 70
Cost of economizer (f.o.b. factory)	$8 to $10 per tube
Cost of economizer erected	$12 to $15 per tube

The following formula is given for draft pressure in inches for a given height of chimney:

$$p = H[(7.64 \div Ta) - (7.95 \div Tg)].$$

In which H is the height of chimney in feet above grate, Ta the absolute temperature of air and Tg the absolute temperature of chimney gases.

Superheaters.

Among the advantages gained by installing an efficient superheater may be included: (1) Absence of moisture in the steam; (2) decreased cylinder condensation; (3) lessened work of the boiler; (4) greater economies for the steam engines and turbines.

It is possible to heat steam, provided it is not in contact with the water in the boiler, to temperature higher than that at which the steam is formed. Steam of a temperature greater than the saturated temperature corresponding to the pressure is called superheated steam. The heat necessary to produce superheated steam is found by multiplying the degrees of superheat desired by the specific heat of the superheated steam at the given pressure and temperature.

Superheaters are of two classes. The attached superheaters consist of coils of pipe placed in the path of the hot flue gases on their way from the boiler to the chimney; the principal objections to this type being the drop produced in draft between the boiler and chimney, and the variation in superheat with the load carried by the boiler. The second class of superheaters are independent of the boiler, and separately fired; and the steam can be superheated to any temperature. The attached superheater is more economical in fuel and is usually used in plants requiring moderate superheats.

The gain in economy due to superheating may be taken as 10% for the first 100° F. of superheat, and about 4% for superheats from 100° to 150° above saturated temperature and at ordinary working pressures.

It must be remembered that additional heat must be supplied to superheat steam, additional fuel required varying from about 2% for superheats of 25°, to 6% for about 100°, and about 12% for 200°.

The lowering in the steam consumption by superheating to 100° for the several types of prime movers is approximately as follows:

Simple engines, low speed	20 to 30%
Simple engines, medium speed	15 to 20%
Compound engines	10 to 15%
Steam turbines	6 to 12%

For moderate superheats about 3 square feet of superheating surface is required per boiler horsepower.

The following equations give the cost of attached or built-in superheaters, and are not applicable to separately fired superheaters.

For 100° F. of Superheat;
Cost in dollars = 165 + 2.6 times the boiler-horsepower.
For 200°;
Cost in dollars = 52 + 3.5 times the boiler-horsepower.
For 300°;
Cost in dollars = 40 + 4.3 times the boiler-horsepower.

An important fact, often over-looked, is that piping intended for saturated steam is not always suitable for superheated steam, especially if the superheat is as high as 150°. Superheated steam causes increased strains in piping and fittings, and if poor quality cast-iron fittings are used trouble will be experienced sooner or later. Double extra-heavy pipe with steel fittings is usually employed.—A. A. Potter and S. L. Simmering in "Electrical World."

Publications.

All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.

Maryland Commission, 1915.—Yes, the year 1915 is correct. The first annual Maryland Commission report issued for the year 1915, has not been rushed through so as to make a record. Its contents and make-up indicate thoughtful care and attention. The matter of principal interest to our readers is in the order providing for a B. T. U. standard and the reasons therefor. The report states that the dividends declared on capital stock totaled over $40,000,000 by the 188 Companies under its jurisdiction.

Doherty News.—This, the newest of successful magazines which gas and electric companies issue for their employees, marks quite an advance with respect to breadth as well as news value. The publishers have an advantage over the earlier publications, as they had something tangible to follow and avoid. The issues, so far offered, indicate a wealth of good material, that becomes available for the whole industry. This is partly due to the fact that the contributors often write of things personal and pertinent, which would not come to sight through the trade papers or the associations.

Chicago is Behind the Times.—The campaign in Chicago to have the candle power standard changed to a heating standard is being played-up very effectively in the newspaper advertising of the company. A recent "ad." reads as follows:

Chicago is Behind the Times
in demanding
"22-candle power" gas.

For the "Candle Power of Gas" has nothing whatever to do with the value of gas in a mantle light—a factory fire—a water heater or a cooking range, etc.

Electrolysis Mitigation.—An elaborate paper on electrolysis has been issued by the Bureau of Standards, under the title of "Special Studies in Flectrolysis Mitigation." Technical Paper No. 54, being a report b, Messrs. Burton McCollum and G. H. Ahlborn, on conditions in Springfield, Ills.

The report covers some 65 pages, with numerous maps and charts, that give a very clear idea of the conditions surrounding a survey of this kind. The data should be of value to gas engineers having troubles along this line. Another report, No. 55, on the same subject, covering conditions at Elyria, O., is also available.

The Year 1943:

EASTER Sunday this year occurs April 23d. It will not occur again as late as that until 1943, when it will come on April 25th. In the year 2000 it again comes on April 23d.

This is one of the bits of information which will be found in "Graphite," the monthly news bulletin of Dixon products.

An Electric Knocker.—Every employee of a gas company, from the office boy up to the president, should become familiar with the things one of the big electric companies are saying about gas. The Westinghouse Lamp Company issues a series of Salesmens' Lamp Hand-Books, and No. 5 includes some of the arguments to use with a house owner using gas.

"Think of the beautiful fixtures you could have. Think of the cozy effect of table lamps in the living room and bedroom. Remember that electricity is modern—it stamps your home as a modern home, and you might consider, too, that the electrically-lighted house is worth more because of it.

"Consider the convenience of electric light. As you come in, you press a button, and the hall is lighted. None of the bother of matches when you have electric light. And when you house is wired you have at your disposal all of the conveniences of modern housekeeping—electric toaster stoves, flatirons, coffee percolators, fans for the hot summer nights, curling irons and what not. The convenience of electric light alone is worth the cost of wiring your home.

"Now, under gas light, your rugs and draperies and the dresses you wear at night, do not have their true colors. The quality of gas light neutralizes certain colors and entirely changes others. With electric light and Mazda lamps, you get a light that is much like daylight, a light that will add to rather than detract from, the beauty of your furnishings and your gowns.

"Electric light is economical; you are much less apt to leave lights burning when you know that they can be turned on again without striking a match and hunting for the fixture in the dark.

"Electric light is economical, too, from another viewpoint—that of cleanliness. Gas is dirty. You may not realize its effect on your walls and ceilings, but their is a certain amount of dirt being deposited on them all the time. When you realize how clean electric light is, you can also see the economy of it considering the saving of your furnishings and wall paper.

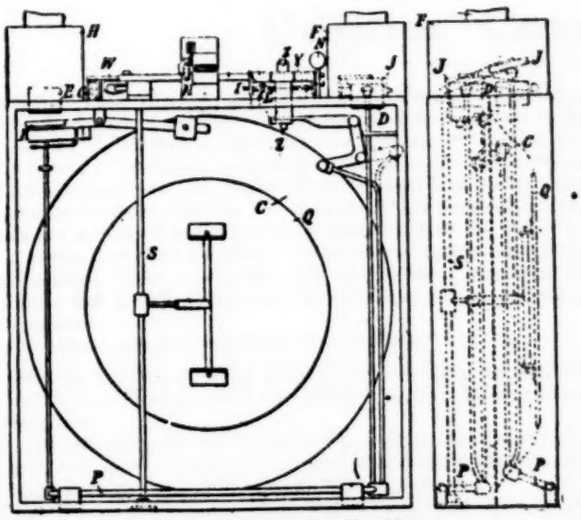
"Another undesirable feature of gas, especially in summer time, is the heat. The gas lamp gives off a large amount of heat, which is not healthy. This bad feature is elimated with electric light.

"Finally, think how safe electric light is. No matches, no open flames, practically no danger of fire at all."

The arguments presented in this pamphlet have been answered many times, and some need no answer, their untruthfulness being apparent. It is to be hoped that even before the millenium advertisers will realize that knocking is poor busines, especially as between gas and electricity as long as oil and coal continue as their real competitors.

New Methods and Appliances.

GAS METER WITH POPPET VALVES.—English patents have been issued for a gas meter in which poppet valves are operated intermittently with a quick motion, at the end of each movement of an oscillatory diaphragm situated between a pair of measuring chambers.



White and Canova's Dry Gas Meter.

In the meter shown, a rectangular case *A* is formed with a central partition, in which is a reciprocatory flexible diaphragm *C*. At the upper side of the case, two cylindrical apertures, *D E*, are arranged in conjunction with each chamber—a gas inlet and gas outlet, respectively. The inlet apertures for the chambers have their outer ends enclosed in a compartment, *F*, with which communicates the main inlet pipe, and similarly the two outlet apertures have their outer end enclosed in a chamber, *H*, with which communicates the main outlet pipe. Over the upper end of each inlet aperture is a flat disc valve, *J*, and beneath the lower end of each outlet aperture a disc valve, *K*. The valves are mounted on levers; and motion is imparted to them by rods adapted to lift them off their seats. The rods of each chamber are operated by their own rocking bar, *P*; the arrangement being such that a closing movement of one valve is accompanied by an opening movement of the other.

As in ordinary dry meters, the reciprocatory motion of the diaphragm is utilized far actuating the valves. The central plate, *Q*, on the diaphragm, is connected to a vertical rocking shaft, *S*, which projects through a stuffing-box in the top of one of the measuring chambers. To the end of the shaft is secured a lever, which (by means of a link) is connected to another lever, which at one end is pivoted to a spring-controlled lever, *W*, and at the other end is provided with a roller, which moves across a bar, *Y*, secured to a valve-operating shaft, *Z*. During each oscillation, movement is transmitted through the mechanicism described to the spring lever, *W*, and the latter is moved during rather more than one-half of the motion against the spring, *G*, which acts directly on the lever and may be supplemented by another spring connecting the lever, *W*, and the bar, *Y*. During the movement the roller is moving idly along the bar on the valve-operating shaft.

The arrangement is such that, with the operation of the bars, *P*, the positions of all the valves are rapidly reversed—that is to say, the open valves are closed and the closed valves are opened. The chamber which was previously receiving gas from the inlet is now caused to discharge to the outlet; and the other chamber is put into communication with the inlet. During the reverse movement of the diaphragm the roller again slides across the bar, *Y*, on the valve shaft; but no motion is imparted to the latter until a peg, securing the bar to the locking lever, *I*, is disconnected from the lever by the action of the peg on a projection, then another change over of the valves occurs. The locking levers are controlled by a spring, *L*, so that they automatically engage the pegs on the bar, *Y*. Simultaneously with the liberation of one peg on the bar the other peg is engaged. By arranging the valves as shown, the normal pressure of the gas tends to keep them on their seats.

In the operation of the meter, the valves remain fully open throughout the greater part of each movement of the diaphragm, and close suddenly near the end of it. Preferably the valves are arranged so that both inlet valves and both outlet valves remain open simultaneously for a short interval; and the gas commences its flow into, or out of, one of the chambers before the flow into, or out of, the other chamber is completely interrupted. An air-buffer, *N*, may be arranged in conjunction with the lever, *W*, to control the rate of operation of the valves and permit the reversal to be effected without shock or noise.

Items of Interest from Various Localities.

AT the annual meeting of The Welfare Club of the Meriden (Conn.) Gas and Electric Light Companies, held at the club rooms, on March 21, supper was served at 6:45 o'clock, to forty members out of a total membership of fifty-eight. "The following officers were elected: I. D. Fowler, President; S. R. Bricker, Vice-President; C. Greenhouse, Secretary; W. A. Carey, Treasurer. Executive Board: I. D. Fowler, S. R. Bricker, C. Greenhouse, C. A. Learned, W. E. Dunlop, W. O. Brewer, E. J. Frazier, M. Jones and C. J. Hunt. During the evening entertainment was furnished by members of the Club; and papers on the Kinetic principle of combustion were read and discussed by the members. This meeting marked the first anniversary of the organization, and a review of the year's activities shows that the Club has been a success, from both the employers' and employes' point of view."

THE cards from the meter readers of the Columbus (O.) Railways, Power & Light Company carrying the readings of the customers, meters, pass through what is known as the load-curve department on their way to the billing department. It is the duty of the load-curve department to scrutinize the cards to determine whether any customers' bill seems unduly high. If a reading appears "suspicious" the card is held until it can be determined definitely that the higher charge is correct. When bills for these are sent out the entire record of investigations and tests, made on the premises of customers is turned over to the complaint department. Then if a controversy arises the data is at hand with which to effect a settlement of the case.

THE town of Wakefield, Mass., will hold a special town meeting next month to consider the question of selling its municipal gas plant.

THE 11th annual meeting of the Natural Gas Association of America, will be held in Pittsburgh, Pa,, May 16, 17 and 18. The president, Mr. William Y. C rtwright, of Cincinnati, O., will call the meeting to order on Tuesday, May 16th, in the Restaurant Building, at the Exposition, Third street and Duquesne Way. United States Congre man James Francis Burke, will welcome the Association, and Chri Payne, of Pittsburgh, will respond to the address of welcome in behalf of the association. There will be but one session each day, starting at 10 A.M. and adjourning at 3 P.M., with a 30 minute intermission for lunch.

THE McClintic-Marshall Construction Company, of Pittsburgh, has purchased the entire capital stock of the Riter-Conley Manufacturing Company. The present officials, who have acted since the death of Mr. Thomas B. Riter; namely, J. Gilmore Fletcher, President, and Joseph Riter and H. A. Carpenter, vice-presdents, will retire from the board of directors and from the management of the company. The McClintic-Marshall Construction Company is known throughout the world as operators of large structural concerns about Pittsburgh and in other parts of the country. They are controlled by the Mellon interests, of Pittsburgh, who also control many large industrial enterprises, including the Aluminum Company of America, the H. Koppers Company and the Gulf Oil Corporation.

ON April 1st, Mr. Cyrus S. Eaton became a member of the banking firm of Otis & Co., Cleveland, O. Mr. Eaton is President of the Continental Gas and Electric Corporation and a director of more than a score of public utility companies in the United States and Canada, and is identified with leading banking and industrial institutions of Cleveland.

H. D. FRUEAUFF has been appointed vice-president of the City Light & Traction Company, Sedalia, Mo. Mr. Frueauff was formerly general manager and treasurer of the company, in which positions he continues.

MR. W. S. RATHELL, manager for the Texas Power & Light Company at Waco, has resigned and will engage in business in Houston. Mr. Rathwell went to Waco in 1898, as manager of the Citizens' Street Railway Company, then controlled by the Henry C. Scott interests of St. Louis, and of the Waco Gas Company, and was in charge of the street railway, electric light and gas interests of the city for thirteen years. These interests were purchased in 1911, by the J. F. Strickland interests, and Mr. Rathell continued as manager until June, 1912, when the traction interests were taken over by the Southern Traction Company. When this separation came, Mr. Rathell went with the Texas Power and Light Company in charge of the gas and electric interests. During the time that he was local manager for the Texas Power and Light Company he was also supervising engineer of the gas properties at Brownwood, Cleburne, Denison and Paris.

AFTER a visit so the Universities of Wyoming, Nebraska, Minnesota, Illinois, Kansas, Arkansas and Texas, Iowa State College, Purdue University, Kansas Agricultural College and Oklahoma and Texas A. & M., winding up with the universities of Colorado, Secretary N. J. Dicks, of the school of Gas and Electric Practice, operated in connection with the Denver Gas and Electric Light Company by Henry L. Doherty & Co., believes the new cadet material is of the highest order. "I have become very much enthused with the prospect of getting 20 crack-a-jack men for Denver," says Mr. Dicks. "I feel that my trip was a decided success and that the effects of it will be felt in the years to come."

A. W. YOUNG, general manager of the Knoxville (Tenn.) Gas Company, was in New York City with a party of Knoxville City Officials, including Mayor McMillan and four councilmen. The city fathers were the guests of the Knoxville Gas Company on a tour of inspection of gas street lighting at Baltimore, Washington, Philadelphia and New York.

THE North Adams (Mass.) Gas Light Co. is erecting a new 8-ft. water gas set, in a new building alongside the old building, to provide room for which the course of a canal had to be diverted.

DURING 1915, 69,120,000 cubic feet of gas was manufactured at the Bellefontaine (O.) municipal plant. There was sold for illuminating, 8,960,100 cubic feet; 52,450,100 for fuel; and 798,000 for public uses. There are 1,769 consumers of gas in this city, 119 gained during the year. Total receipts for 1915 were $35,556.89 and expenditures $36,046.89 including $6,000 contributed to the sinking fund.

W. S. BALDWIN, lately in charge of the electrical construction department of the Syracuse (N. Y.) Lighting Company, has been appointed superintendent and assistant to Manager L. S. Williams, of the Harrisburg (Pa.) Gas Company. Mr. Baldwin was formerly construction engineer at Harrisburg and has been connected with the United Gas Improvement Company for a number of years.

THE Western Gas Construction Company has the contract for the gas plant at Bismarck, N. Dakota.

THE gas fight in Oak Harbor, O., is in a tangle by the granting of an injunction by Common Pleas Judge Wierman, restraining the Oak Harbor Natural Gas Company from using the streets and alleys for its pipes. The judge previously granted an injunction restraining the city from tearing up the mains. The city withdrew the franchise when the company proposed raising its rate from 50 cents to 75 cents per 1,000 feet.

THE gas fight in Kalamazoo, Mich., is to be revived. It did seem that the citizens were satisfied with the reduction made to 85 cents, but the Mayor has announced his candidacy for re-election on a platform pledging a fight for 75 cents. The Company's franchise expires in July of this year.

THE question at issue between the Chattanooga (Tenn.) Gas Light Company and City Department of Parks and Public Utilities, is based on an ordinance passed by the City council in 1907, before the commission form of government was adopted. The section of the ordinance which may have to be construed by the courts is as follows: Be it further ordained, That the Chattanooga Gas Light Company will run a service pipe into all buildings on the lines of their mains free of charge to the consumer, provided written application is made by the customer, and provided that the point where the service pipe enters the building shall not be more than sixty feet inside the property line. There are two questions about

which the commission and the gas company agree:—(1) Is the "written application" provided for in the ordinance an essential part of the proceeding without which the company would be relieved of its obligation to furnish "free service pipe?" (2) Has the municipality a right to compel the company to "give" sixty feet of service pipe to the consumer, the rule being well established that after the pipe is installed on private property it passes to private ownership?

THE natural gas supply in Hamilton, Ontario, is giving out, and a corporation there is contemplating the construction of a coke oven plant to cost $2,000,000. Natural gas is sold in Hamilton for 40 cents per 1,000, and the city officials are conducting an investigation before amending the gas company's franchise, to ascertain if artificial gas can be supplied at a similar rate.

BETWEEN three and four miles of new gas mains will be laid by the Sheboygan (Wis.) Gas Light Company this spring and summer, to accomodate the city paving projects. It means a great deal of new business for the company, and is in line with the policy of expansion and development.

PRESIDENT I. L. MELOON, of the Twin State Gas and Electric Company, Dover, N. H., who has officiated since June, 1906, and who has acted as general manager since June, 1913, will sever his connections with the company officially on May 1.

MANAGER JOHN J. KIRKPATRICK of the Gas and Electric Department of Holyoke, Mass., has posted notices at the gas works and electric light station to the effect that employees need not expect wage increases under present conditions. He has received requests recently from individuals, and delegations representing the employees, at both plants asking for more pay.

THE new price agreement between the City Commission and the Dayton (O.) Gas Company, which is controlled by the Ohio Cities Gas Company, went into effect April 1, and in accordance with the contract plans are under way for the elimination of the artificial gas, a universal natural gas supply being the arrangement.

SERVICE Director Goodwillie, of Toledo, O., will permit the Toledo Railways and Light Company to lay pipes in Toledo streets to connect its Water street power house and Erie street gas plant with the Toledo Furnace Company in East Toledo. The law department ruled that if bond is given to replace the streets in proper condition, under its franchises the company has a right to open streets and alleys. The city ordered the work stopped a few days ago.

THE Illinois Utility Commission has handed down an informal order fixing rates in Jacksonville at 95 cents for gas and 10 cents for electricity. The commission granted 30 days for the company to signify its willingness to accept or reject the rates, but stated that in the event that the company rejected them, the rates will be incorporated in a formal order.

THE people of Berlin, N. H., would like to see a gas company organized in that village. Local parties were granted a charter by the New Hampshire Legislature some years ago, but it has never been called for. It is available at any time and could be turned over to any interested party. This question has received more or less attention for some years, but the cost of the plant, pipe lines, etc., would be high, owing to the character of the rock ledges through which pipes would have to be laid.

THE Concord (N. H.) Light and Power Company are just completing a week's demonstration of gas cooking, including lectures by Carolyn P. Webber. The range used in the demonstration was a cabinet with four top burners, two baking ovens and a broiling oven, and will be presented to one of the ladies attending, at the end of the demonstrations. A model gas iron with ironing board, and table lamp will be awarded during the week.

THE city council of East St. Louis, Ills., proposes charging the St. Clair County Gas and Electric Company a rental for gas mains under city streets, at the annual rate of 2 cents per lineal foot for mains under unimproved streets and 5 cents per lineal foot for mains under improved streets. There is some question as to the right of the company to operate under its old franchase.

Utilities Commission News.

FRANCHISE PROPOSALS TO BE SUBMITTED TO VOTERS.—Following the refusal of Stone & Webster to accept proposals contained in the report of one E. W. Bemis, regarding the issuance of traction and electric lighting franchises by the city of Dallas to the Dallas Street Railways Company and the Dallas Electric Light and Power Company, Mayor Lindsley and the city commissioners decided that the propositions contained in the report be placed before the voters of Dallas, at the municipal elections. If the voters approve the franchise suggested, Stone & Webster will have another chance to accept them; and failing acceptance, the franchise will be offered to other concerns.

The franchise proposed embodies the following:

The electric lighting property should be capitalized at $3,600,000, upon which the company would be allowed to earn 7% net annually, maximum.

Electric light rates should be reduced to a figure not determined definitely, but which would not be more than 8 cents per kilowatt hour, as against 10 cents per kilowatt hour at present.

All lighting revenues above operating expenses and allowed net earnings, should be devoted to reduction in light rates.

Complete rehabilitation of the electric light plant and wide extensions of service.

The franchise to be for 10 years only; after that period the city to have the right to take over, either for itself or some other corporation offering better terms, both systems upon payment of a stipulated sum.

Appointment of a public supervisor to represent the interests both of the investors in the properties and of the citizens of Dallas, to have jurisdiction in ordering improvements of service and equipment.

Arbitration of differences between the public utilities company and the city.

The proposition was rejected by Stone & Webster, on the ground that the capitalization and rate of income proposed are both too low. They claimed a value of $5,000,000 each on the light plant and the traction lines east of the river, an aggregate of $10,000,000, and wanted to be allowed to earn 8% upon this.

HIGHER RATES FOR SUMMER SERVICE.—With the approach of summer, the question of rates for service during that season only, assumes importance, and the Maine Public Utilities Commission has put itself on record as to the reasonableness of higher unit rates. The commission in a decision states: "So far as it costs more to serve the twelve-month taker, he should, of course, pay more. But such items as are not modified by the length of time of actual use may, and should, properly be distributed among all of the users whom the public utility must stand ready to serve. The water plant, the electric plant, the gas plant—each is constructed capable of supplying the demand during the period of seasonable use. The capital invested, the depreciation, the normal maintenance, insurance, all of those charges which go on whether a greater or lesser amount of product is being consumed, are required as much for the premises which are regularly occupied during some part of each year, and must be served when occupied, as for those premises which are open and supplied throughout the year. It is the 'readiness to serve' element."

FAVORS PRESENT DIVISION.—Members of the Public Service Commission and the Gas and Electric Light Commission of Massachusetts, have been in conference with the special committee of the Legislature considering consolidating various State commissions. Vice-president E. K. Hall of the New England Telephone and Telegraph Company, present at the request of Chairman Martin Hays, expressed himself favorable to the present supervision. He raised the point that telephone companies, street railways and railroads all deal in service and properly come under the supervision of the Public Service Commission, while the Gas and Electric Light Commission supervises the sale of commodities.

Financial Notes.

FEBRUARY was a month of prosperity for the PACIFIC GAS AND ELECTRIC COMPANY, its surplus, after dividends, showing an increase of $75,958.42 over the total for February 1915. For the year ended Feb. 29, 1916, the report shows as follows:

Gross operating revenue.		Increase.
Electric department	$10,111,370.54	$1,238,227.35
Gas department	7,588,532.13	522,847.74
Other departments	1,033,819.34	*100,938.29
Total gross operating revenue	$18,733,722.01	$1,660,136.80
Expenses.		
Maintenance	987,728.32	*39,060.24
Operating and general	7,218,464.57	282,107.89
Taxes	872,090.42	117,784.16
Reserves for casualties and uncollectable accounts	228,000.00	12,500.00
Reserve for depreciation	1,400,000.00	336,666.66
Total expenses	$10,706,283.31	$709,393.47
Net earnings from operation	8,027,438.70	950,743.33
Add profits on merchandise sales and other miscellaneous income.	477,652.92	152,926,02
Total net income	$8,505,091.62	$1,103,669.35
Bond and other income	3,929,115.80	*256,542.55
Balance	$4,575.975.82	$1,360,211.90
Apportionment of bond and note discount and expense	164,635.05	*257,550.70
Surplus	4,411,340.77	1,617,762.60
Dividends (accrued):		
First preferred	$532,490.50	$435,276.09
Original preferred	600,000.00	.....
Total dividends (accrued)	$1,132,490.50	$435,276.09
Surplus (unappropriated)	$3,278,850.27	$1,182,486.51

* Decrease.

The company has paid out of current funds $981,000 Oakland Gas Light and Heating Company 5% first mortgage bonds, issued March 16, 1891, and will not at present make any capital issues against this capital expenditure. The retirement of these bonds leaves the California Gas and Electric general mortgage and collateral trust 5% bonds a first lien on all the Pacific Gas and Electric properties in Alameda County, these properties being estimated to be worth $20,000,000, and the bonds outstanding under this mortgage being $4,517,000.

THE UNITED GAS AND ELECTRIC CORPORATION has declared a quarterly dividend of 1¾% on its first preferred stock, payable April 1 to stock of record March 28. This is an increase of ¼ of 1% quarterly on the stock, which has been cumulative at a rate of 7% since April 1, 1915, but heretofore has been paying at the rate of 3% semi-annually. Earnings of the corporation from all sources for the year ended Dec. 31, 1915, after deducting all expenses, were $1,321,992; from which were charged $299,965 interest on notes, $136,858 interest on bonds, $42,000 for amortization of discount, and $14,323 interest on notes payable, leaving a balance of $828,845. Dividends on first preferred stock accrued and paid in the year were $626,724, leaving a surplus of $202,121.

THE OHIO GAS AND ELECTRIC COMPANY, Cincinnati, whose request to issue $1,695,095 worth of securities for the purchase of four other companies in southern Ohio was rejected by the Public Utilities Commission a year ago, has filed a new application to issue $1,000,000 in securities to make the purchases. The four companies it seeks to buy are: The Middletown Gas and Electric Company, valued at $838,000; the Franklin Electric Light Co., $66,000; the Leetonia Electric Co., $20,000; and the New Lisbon Gas Co., $44,000. The four companies join in the request.

THE Stockholders of the DERBY GAS COMPANY, have authorized an increase in the capital stock of the company of 8,000 shares, which will raise its capital from $900,000 to $1,100,000. The new stock will be offered to the stockholders at par and payments are to be made in quarterly payments the first of 25% being due May 2 next. The final payment will be due February 2, 1917, next when the certificate will be issued. Each stockholder will be entitled to subscribe for two shares for each nine he now holds. The new stock is to raise funds to pay off certain debts and for meeting the company's requirements in the near future.

DIVIDEND NOTICE.

AMERICAN LIGHT AND TRACTION COMPANY.

The Board of Directors of the above Company at a meeting held April 4, 1916, declared a cash dividend of one and one-half per cent. (1½ per cent.) on the preferred stock, a cash dividend of two and one-half per cent. (2½ per cent.) on the common stock and a dividend at the rate of two and one-half (2½) shares of common stock on every one hundred (100) shares of common stock outstanding, all payable May 1st, 1916.

The transfer books will close at 12 o'clock noon on April 14, 1916, and will reopen at 10 A.M. on May 1st, 1916

391-1 C. N. JELLIFFE, Secretary.

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